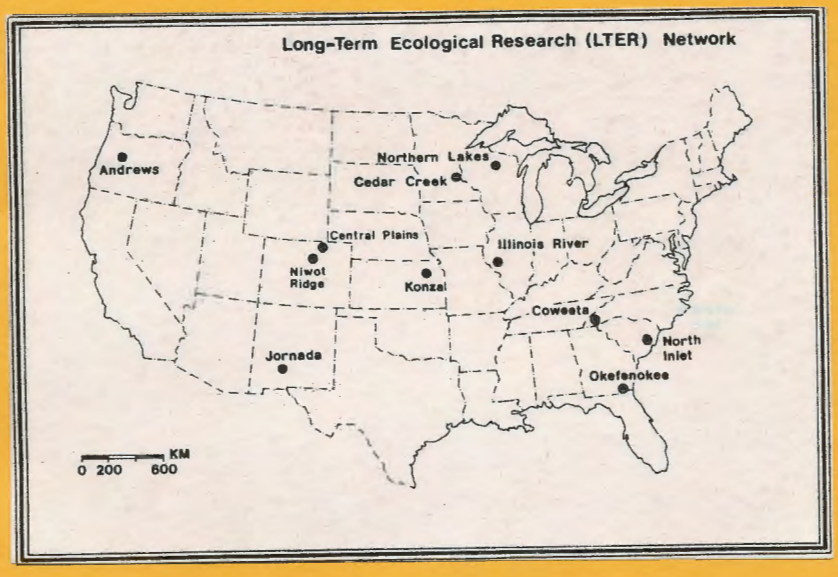
LONG - TERM ECOLOGICAL RESEARCH IN THE UNITED STATES:

A Network of Research Sites

1982



LONG-TERM ECOLOGICAL RESEARCH IN THE UNITED STATES:

A NETWORK OF RESEARCH SITES

James C. Halfpenny (Editor)
Kathy Ingraham and Jeff Hardesty (Assistant Editors)

1982

The Long-Term Ecological Research Program Steering Committee is composed of the coordinating principal investigators or their representatives:

G. R. Marzolf, Chairman
Division of Biology
Kansas State University
Manhattan, KS 66506

Richard H. Waring, Vice Chairman
Department of Forest Science
Oregon State University
Corvallis, OR 97331

J. T. Callahan, ex officio
Program Officer of NSF
Division of Environmental Biology
National Science Foundation
Washington, DC 20550

D. A. Crossley, Jr.
Institute of Ecology
University of Georgia
Athens, GA 30602

William K. Lauenroth
Department of Range Science and
Natural Resource Ecology Laboratory
Colorado State University
Fort Collins, CO 80523

John J. Magnuson
Laboratory of Limnology
North Park Street
University of Wisconsin
Madison, WI 53706

Bernard C. Patten
Institute of Ecology
University of Georgia
Athens, GA 30602

Richard E. Sparks
Illinois Natural History Survey
Box 599
Havana, IL 62644

David G. Tilman
Department of Ecology and
Behavioral Biology
University of Minnesota
Minneapolis, MN 55455

F. John Vernberg
Baruch Institute
University of South Carolina
Columbia, SC 29208

Patrick J. Webber
INSTAAR
Campus Box 450
University of Colorado
Boulder, CO 80309

Walter G. Whitford
Department of Biology
New Mexico State University
Las Cruces, NM 88003

LONG-TERM ECOLOGICAL RESEARCH (LTER)

Long-Term Ecological Research (LTER) is a pilot program supported by the National Science Foundation's Division of Environmental Biology. The program developed during the period from 1976 to 1979 when the first open competition for support was announced. LTER acknowledges:

1) that there are ecological phenomena that occur on time scales of decades or centuries; periods of time not normally investigated with research support from NSF.

2) that many ecological experiments are performed without sufficient knowledge of the year-to-year variability in the system. Interpretation is, therefore, difficult. This is especially true when the system in which the experiment is performed is not at equilibrium.

3) that long-term trends in natural ecosystems were not being systematically monitored. Unidirectional changes that were observed could not be distinguished from cyclic changes on long time scales.

4) that a coordinated network of sites was not available so that comparative experiments could be facilitated. Furthermore, data management was not being coordinated between research sites. Therefore, comparative analyses could not be performed and theoretical constructs could not be conveniently tested.

5) that examples of natural ecosystems where ecological research was occurring were being converted to other uses incompatible with that research.

6) that advances in ecological research often over-simplify, ignore, or treat as constant or insignificant phenomena at higher or lower levels of organization. An approach that will help reduce this logical weakness is to perform intensive investigations at single sites, leading to an accumulation of overlapping information, i.e., that site specific research will, through time, accumulate data sets that become increasingly valuable because they reveal pattern and control at these several levels of ecosystem interaction.

Initial convergence of LTER effort was encouraged by requiring that sites address research efforts in five core areas. These were: 1) pattern and control of primary production; 2) spatial and temporal distribution of populations selected to represent trophic structure; 3) pattern and control of organic matter accumulation in surface layers and sediments; 4) patterns of inorganic inputs and movements of nutrients through soils, groundwater, and surface waters; and 5) patterns and frequency of disturbance to the research site.

The institutions serving in support of LTER sites are committed to encouragement of collaborative research by scientists at other institutions. LTER sites are to be considered regional or national research facilities. If you are interested in utilizing these facilities please contact directly the sites as identified in this brochure.

G. R. Marzolf, Chairman

ACKNOWLEDGMENTS

Special thanks are due Fatima Al-Rahim and Mori Maag for their help in compiling and typing this booklet.

H. J. ANDREWS EXPERIMENTAL FOREST LTER SITE

SITE NAME: H. J. Andrews Experimental Forest

INSTITUTIONAL AFFILIATION: Oregon State University
U. S. Forest Service
Pacific Northwest Forest and
Range Experiment Station

LTER RESEARCH TOPICS: Composition, structure, and process change during succession
Nature of forest-stream interactions
Population dynamics of forest stands
Effects of nitrogen fixers on soils
Log decomposition

PRINCIPAL BIOME: Coniferous forest

MAIN COMMUNITIES: Douglas fir, western hemlock, redcedar
True fir and mountain hemlock
Streams

EXISTING DATA BASES:
- Meteorology.
- Physical and chemical composition of terrestrial and aquatic environments.
- Vegetation composition and structure.
- Invertebrate community composition.
- Vertebrate community composition and abundance.

CLIMATE SYNOPSIS:
Quasi-mediterranean with mild, wet winters and warm, dry summers. Annual precipitation about 250 cm, January mean temperature is 2° C, and July mean temperature is 20° C.

NARRATIVE:
The H. J. Andrews Experimental Forest was established in 1948 by the U. S. Forest Service to examine the effects of different logging methods on reforestation, erosion, and water quality. It has become an active site for research on coniferous forest and stream ecosystems. In 1969, the Andrews Forest was selected as an intensive study site by the Coniferous Forest Biome (International Biological Programme) because of the existing long-term data base. It was also designated a Biosphere Reserve by U. N .E. S. C. O. in 1975 because it contains good examples of forest and stream ecosystems common throughout the Pacific Northwest. Since 1977, the National Science Foundation has supported a baseline monitoring program which includes: climatic variables; streamflow; stream water chemistry; atmospheric depostion; litterfall; and successional changes in the composition and structure of the vegetation. Oregon State University, the Pacific Northwest Forest and Range Experimental Station, and the Willamette National Forest have shared administrative responsibility for the Andrews Forest since 1977. Current management is directed toward maintaining the research value of the site, and enhancing it wherever possible. More than thirty separate research projects are now using the Andrews Forest. These are coordinated by a committee of scientists and administrators from the institutions and agencies sharing responsibilty for the site.

Five new projects are being initiated under the National Science Foundation's Long-Term Ecological Research program on the Andrews Forest and nearby research natural areas. These studies will investigate: 1) succession in northwestern forests with an emphasis on environmental control of natality and mortality of important species; 2) long-term changes in primary production and soil physical and chemical properties in stands having different densities of an early successional shrub species which fixes nitrogen; 3) density-dependent mortality processes in young Douglas fir stands; 4) cumulative downstream effects on aquatic ecosystem production, composition, and structure of standard forest management practices; and 5) the decomposition patterns of coarse woody debris in different terrestrial and aquatic environments.

FACILITIES:
Office, laboratory, and living facilities at the Andrews Forest are located near the main entrance on a terrace beside Lookout Creek. Current facilities include: four bunkhouse trailers with a capacity of twenty-four; two office/ laboratory trailers and a herbarium office which provide working space for twelve; and a warehouse/ shop. In addition, two small camper trailers are available for special needs, and a small cabin at Mark Creek provides overnight space for scientists working there. Plans are being finalized to increase bunkhouse capacity and office space for an additional twelve people.

LOCATION: 25 km east of Eugene, Oregon.
latitude: 44° 14' N
longitude: 122° 11' W
elevation: 445 to 1,620 m

ADDRESSES:

Coordinating Investigator:
Dr. Jerry Franklin
Forestry Sciences
Laboratory
3200 Jefferson
Corvallis, OR 97331
(503) 754-2405

Site Director:
Art McKee
H. J. Andrews Experimental Forest
P. O. Box 300
Blue River, OR 97413

INVESTIGATORS:

Kermit Cormack	- Succession
Kenneth Cummins	- Forest-stream interactions
Jerry Franklin	- Succession, log decomposition
Stan Gregory	- Forest-stream interactions
James Hall	- Forest-stream interactions
Jack Lattin	- Succession, forest-stream interactions
Arthur McKee	- Succession, forest-stream interactions
David Perry	- Population dynamics of stands
Phil Sollins	- Nitrogen fixers
Fred Swanson	- Succession, forest-stream interactions
Richard Waring	- Succession

CEDAR CREEK LTER SITE

SITE NAME: Cedar Creek Natural History Area

INSTITUTIONAL AFFILIATION: University of Minnesota

LTER RESEARCH TOPICS:
- Primary productivity
- Nutrient budgets
- Soil chemistry
- Climatic variation
- Plant and herbivore dynamics
- Succession in oak savannah

PRINCIPAL BIOMES:
- Hardwood forest
- Tall grass prairie

MAIN COMMUNITIES:
- Oak savannah
- Oak forest
- Conifer bog
- Great Lakes pine forest
- Old fields
- Wetland marsh and carr

EXISTING DATA BASES:
- Check lists of plants and vertebrates.
- Maps of land use history, vegetation, soils, and topography.
- Aerial photographs.
- Climatological data.
- Primary productivity of selected sites.
- Telemetry data on movement and behavior of selected vertebrates.
- Plant species abundances in old fields and permanent quadrats.
- Effects of N and Mg on early successions.

CLIMATE SYNOPSIS:

Continental climate with cold winters, hot summers and precipitation scattered throughout the year. Mean temperatures are 22.2° C in July and -0° C in January. Precipitation averages about 66 cm per year, with June and August being the wettest months.

NARRATIVE:

Cedar Creek Natural History Area is a 2,185 ha Experimental Ecological Reserve located 50 km north of Minneapolis-St. Paul on a large glacial outwash plain. It is managed by the University of Minnesota's Field Biology Program. Cedar Creek has been the site of ecological research ranging from Lindeman's studies of Cedar Bog Lake to work on primary productivity, nutrient cycles, and secondary succession to radiotelemetry of animal habitat use and movement patterns. Cedar Creek includes a wide array of habitat types, ranging from oak savannah to prairie to deciduous hardwood forests. Its soils, mainly derived from the outwash sand, span five of the ten soil orders.

Since its establishment in the 1940's, Cedar Creek has been managed to maximize present and future ecological research opportunities. For instance, a program of prescribed burnings was instituted 20 years ago on the oak savannah, and has resulted in an array of habitats which differ in their fire history. Similarly, agricultural fields have been abandoned on a regular schedule to give old fields of various known ages and past agricultural usages. In addition to such terrestrial habitats, Cedar Creek includes numerous streams, bogs, lakes, swamps, and marshes which are available for aquatic research.

Long-term observational and experimental studies of the relationships between primary productivity, nutrient budgets, soil chemistry, climatic variation, and plant and herbivore dynamics are being performed in four different stages in the natural secondary successional sequence of the oak

savannah. The research is an attempt to understand succession through a synthesis of population, community, and ecosystem perspectives combined with long-term experimental manipulations of natural communities. The research includes detailed observations of large plots and experimental manipulations of smaller plots. The manipulations, which will be continued for the duration of this project, include: 1) different levels of nitrogen fertilization with all other elements supplied in excess; 2) fertilization with each of 6 nutrient elements applied singly; 3) disturbance-nitrogen interactions; 4) gopher removal; 5) deer removal; 6) insect removal; and 7) fire. The research is centered on the mechanisms whereby soil processes, interspecific plant competition, and herbivores influence the diversity and species composition of natural plant communities.

FACILITIES:

Cedar Creek has 8 permanent buildings, including two year-round laboratories, a shop building, a storage building and work area, a winterized animal holding facility, three year-round family homes, and two summer cabins. There is a 12 person dormitory with a kitchen. The laboratories include offices, a general work area, an electronics laboratory and house, an herbarium, an insect collection, and a mammal collection. Two jeeps are available for general use on premises. Major items of equipment include a Data General Nova minicomputer, Xerox 820 microcomputer, Hewlitt Packard calculator with plotter, Texas Instruments Portable Data Terminal, oscilloscopes, spectrum analyzers, drying room, top-loading electronic balances, and meteorological equipment. A shuttle bus operates between the main campus and Cedar Creek on a daily basis during the summer field season.

LOCATION: 50 km north of Minneapolis-St. Paul, Minnesota.
- latitude: 45° 24' N
- longitude: 93° 12' W
- elevation: 175 to 288 m

ADDRESSES:

Coordinating Investigator:
Dr. G. David Tilman
Department of Ecology
and Behavioral Biology
University of Minnesota
318 Church Street S. E.
Minneapolis, MN 55455
(612) 376-9455

Site Director:
Mark Stillwell
Cedar Creek Natural History Area
2660 Fawn Lake Drive
N. E. Bethel, MN 55005
(612) 434-5131

INVESTIGATORS:

G. D. Tilman	- Ecology
D. Grigal	- Soil science, ecology
W. Mattson	- Insect ecology
P. J. Regal	- Ecology
P. Werner (Michigan State University)	- Plant ecology
J. R. Tester	- Ecology, behavior
D. B. Lawrence	- Plant ecology
P. Morrow	- Insect ecology
D. B. Siniff	- Ecology, behavior, statistics

CENTRAL PLAINS EXPERIMENTAL RANGE LTER SITE

SITE NAME: Central Plains Experimental Range (CPER) - Shortgrass Steppe

INSTITUTIONAL AFFILIATION: U. S. Department of Agriculture - Agricultural Research Service (ARS)

LTER RESEARCH TOPICS:
- Hydrologic cycle and primary production
- Key microbial responses
- Plant succession
- Plant and animal population dynamics
- Organic matter aggregation or degradation
- Influence of erosion cycle on redistribution of matter, nutrients, and pedogenic process
- Influence of atmospheric gases, aerosols, and particulates on primary production and nutrient cycles

PRINCIPAL BIOME: Grassland

MAIN COMMUNITIES:
- Shortgrasses
- Succulents
- Half-shrubs

EXISTING DATA BASES:
- Structure and function of grassland ecosystems.
- Influence of various stress factors.
- Soil, root, and microorganism interactions affecting nutrient transformations.
- Plant-animal interactions.
- Additions, losses, and transformations of nitrogen.
- Atmospheric deposition and gas analysis.
- Above- and below-ground grazing.
- Long-term meteorlogical monitoring.
- Organic matter and nutrient cycling.
- Effects of atmospheric pollutants.
- Soil-plant associations.
- Plant genetic response to grazing.

CLIMATE SYNOPSIS:

Extreme daily, seasonal, and long-term climatic variability in both range and predictability. Mean monthly temperatures range from -4° C to 22° C seasonally and have a daily average max-min range of 17 C. Annual precipitation averages 311 mm and ranged between 110 and 580 mm over the past 31 years of measurement. Approximately 70% of the mean annual precipitation occurs during the April to September growing season.

NARRATIVE:

CPER is administered by the U. S. D. A. - Agricultural Research Service (ARS) and was the site for much of the intensive research conducted by the Natural Resource Ecology Laboratory (NREL) during the Grassland Biome portion of the International Biological Programme. It is less than a one-hour drive from CPER to the laboratory, computer, and office facilities of the NREL on the Colorado State University campus, Fort Collins, Colorado.

The shortgrass steppe on CPER is dominated by shortgrasses (64%), succulents (21%), and half-shrubs (8%). The main species of these groups are Bouteloua gracilis, Opuntia polyacantha, and Artemisia frigida, respectively. Average above-ground net primary productivity is 2,125 g/sq. m and ranges from 180 to 60 g/sq. m depending on soil water. Below-ground productivity is 568 g/sq. m with a range from 411 to 686 g/sq. m. Major vegetation structural differences occur in swales (saltgrass meadows) dominated by Distichlis stricta and Sporobolus asper, and on floodplains where the shrub Atriplex canescens is

an important component.

The CPER has been the site of major projects and programs of research. Large volumes of U.S.-I.B.P. Grassland Biome data concerning the structure and function of grassland ecosystems and the influence of various stress factors are available in NREL data banks. Current on-site studies include: soil, root, and microorganism interactions affecting nutrient transformations; plant-animal interactions; additions, losses, and transformations of nitrogen; atmospheric deposition and gas analysis; above- and below-ground grazing; and long-term meteorlogical monitoring. Associated studies on other grassland sites include organic matter and nutrient cycling, effects of atmospheric pollutants, soil-plant associations, and plant genetic response to grazing.

Past and current research will provide an important base and source of information for accomplishing our LTER goals. Our core research will emphasize: 1) the relations between the hydrologic cycle and primary production, key microbial responses, plant succession, plant and animal population dynamics, and organic matter aggregation or degradation; 2) the nature of the erosion cycle and its influence on redistribution of matter, nutrients, and pedogenic processes; and 3) the influence of atmospheric gases, aerosols, and particulates on primary production and nutrient cycles.

FACILITIES:
- -Offices
- -Field laboratories
- -Large animal handling and holding pens
- -Sample preparation and storage facilities
- -Dormitory
- -Dining room
- -Kitchen

LOCATION: 100 km east of Ft. Collins, Colorado adjacent to Pawnee National Grassland.
- latitude: 40° 49'N
- longitude: 104° 46'W
- elevation: 1,650 m

ADDRESSES:

Coordinating Investigator:	Site Director:
William K. Lauenroth	Marvin Shoop
Dept. of Range Science and	U.S.D.A.-A.R.S. Forest
Natural Resource Ecology Lab.	and Range Management
Colorado State University	Crop Research Laboratory
Ft. Collins, CO 80523	Colorado State University
(303) 491-5571	Fort Collins, CO 80523

INVESTIGATORS:

C. V. Baker	-Data management
J. L. Capinera	-Entomology
C. V. Coleman	-Below-ground systems
J. K. Detling	-Plant ecophysiology
K. G. Doxttader	-Microbiology
J. H. Gibson	-Atmospheric deposition
R. M. Hanson	-Vertebrate ecology
R. D. Heil	-Soils
H. W. Hunt	-Systems ecology
D. A. Klein	-Microbiology
W. K. Lauenroth	-Plant ecology
W. A. Laycock	-Range management
J. A. Logan	-Entomology
W. J. Parton	-Meteorology
L. R. Rittenhaus	-Ruminant nutrition
M. Shoop	-Range managment
M. J. Trlica	-Plant physiology
R. G. Woodmansee	-Soils, plant ecology

COWEETA LTER SITE

SITE NAME: Coweeta Hydrologic Laboratory

INSTITUTIONAL AFFLIATION: University of Georgia
U. S. Forest Service
Southeastern Forest Experimental Station

LTER TOPICS: Long-term dynamics of forest ecosystems
Ecosystem response to perturbation
Input-output elemental dynamics in forested ecosystems
Land-stream interactions
Nitrogen dynamics in decomposition processes
Consumer regulations of ecosystem processes

PRINCIPAL BIOME: Deciduous forest
MAIN COMMUNITIES: Eastern deciduous forest
White pine plantations

EXISTING DATA BASES:
- Climatology.
- Hydrology.
- Water and sediment chemistry.
- Throughfall and lysimeter chemistry.
- Vegetation, leaf litter inputs, standing crops and decay rates.
- Gaseous nitrogen transformations.
- Soil and canopy consumers.
- Aquatic fauna.
- Organic and inorganic seston.
- Primary aquatic production.
- Allochthonous and autochtonous inputs.
- Aquatic decomposition and nutrient spiraling.

CLIMATE SYNOPSIS:
Average precipitation is 180 cm per year, well distributed seasonally. Snow typically contributes less than 2%. Average temperature is 13° C with a 20° C growing season temperature.

NARRATIVE:
The Coweeta Hydrologic Laboratory is located in mountainous terrain which supports moist stands of eastern deciduous forest. Our major focus is to develop information on the long-term dynamics of forested ecosystems. Research is concentrated at the ecosystem process level in terrestrial and stream studies. Objectives are documenting: 1) long-term trends in ecosystem responses; 2) responses to anthropogenic influences; 3) long-term changes in input-output nutrient dynamics; and 4) process-level changes during ecological succession.

FACILITIES:
On-site laboratories for climate measurement, hydrology, water chemistry, and related analyses. Limited space for visiting investigators. At the University of Georgia, laboratory space and equipment are available in the 25,000 square foot ecology buildng.

LOCATION: 17 km south of Franklin, North Carolina, in the Nathahala mountains.
latitude: 35° N
longitude: 83° 30' W
elevation: 679 to 1,592 m

ADDRESSES:

Coordinating Investigator:
Dr. D. A. Crossley, Jr.
Institute of Ecology
University of Georgia
Athens, GA 30602

Site Director:
Dr. Wayne T. Swank
Southeastern Forest Experimental Station
Coweeta Hydrologic Laboratory
Route 1, Box 216
Otto, NC 28763

INVESTIGATORS:

D. A. Crossley, Jr.	- Consumers, decomposition
John Fitzgerald	- Sulfur dynamics
Clayton S. Gist	- Consumers
Willard H. Grant	- Geology
Bruce L. Haines	- Nutrient cycling
Judy L. Meyer	- Stream processes
William H. Murdy	- Vegetation processes
George R. Parker	- Vegetation processes
Donald L. Phillips	- Stand dynamics
J. Dan Pittillo	- Vegetation inventory
H. L. Ragsdale	- Vegetation and nutrient dynamics
Wayne T. Swank	- Hydrology, input-output dynamics
J. Bruce Wallace	- Stream proceeses
Jackson R. Webster	- Stream processes

ILLINOIS RIVER AND UPPER MISSISSIPPI RIVER LTER SITE

SITE NAME: Illinois River and Upper Mississippi River (Large River)

INSTITUTIONAL AFFILIATION: Illinois Department of Energy and Natural Resources
- Natural History Survey Division
- Water Survey Division
- Geological Survey Division

Western Illinois University
- Department of Biological Sciences

LTER RESEARCH TOPICS: Succession and perturbation
Water and sediment budgets
Hydrological studies
Ecosystem biotic structure
Ecosystem function

PRINCIPAL BIOME: Temperate deciduous forest

MAIN COMMUNITIES: Riverine marsh
Northern floodplain forest
Off-shore and mud-bottom benthos
Aquatic plant beds
Phytoplankton, zooplankton
Firm substrate community in swift current

EXISTING DATA BASES:
- Hydrology, weather, and water quality.
- "Benchmark" data from 1900 on fishes, plankton, and benthos from the Illinois River.
- Annual surveys of fishes and waterfowl.
- Commercial fishing statistics.
- Surveys of benthos, aquatic, and floodplain vegetation.
- Sediment characteristics and sedimentation rates.

CLIMATE SYNOPSIS:

Continental, with an annual temperature range of 61° C. Summer maxima average just under 38° C, winter minima about -23° C. Annual precipitation averages 89 cm and varies from 58 to 122 cm. The monthly average is 5 cm or less from November through February. More than half the average annual precipitation occurs during the growing season of May through September with 70 to 80% of the summer rain from thunderstorms. Annual snowfall averages 64 cm. The rivers generally freeze over during December and January.

NARRATIVE:

The Large River LTER has four components which include: 1) succession and perturbation in the Illinois and Upper Mississippi Rivers; 2) water and sediment budgets, and hydrological studies; 3) ecosystem biotic structure; and 4) ecosystem function. Succession and perturbation studies reconstruct the past, while hydrological studies determine present sediment and water budgets for the study sites, in support of the biological studies of the ecosystem structure and function.

In succession and perturbation studies of the rivers, sediment cores and tree ring cores will be analyzed to determine patterns and frequency of natural and man-induced disturbances to the sites. Studies on ecosystem biotic structure will begin by examining spatial and temporal distribution of populations representing different trophic levels in the remarkably productive Keokuk Pool and in the tailwaters below Keokuk Dam, where much of the organic material produced or processed in the Pool is probably utilized by both low-level and high-level consumers.

When new Pool 26 is formed in 1984-85, its structure (both biotic and

physical) and function will be compared to Keokuk Pool, and the rate and pattern of change determined.

Also studies from all four components of the Large River LTER will be conducted on Peoria Lake (a mainstem lake) on the Illinois River, a highly perturbed system, where important structural components have been eliminated.

FACILITIES:

Laboratory and office space can be made available at the two river research laboratories, located at Havana and Grafton, Illinois, on the Illinois River. The Alice Kibbe Life Science Station is located near Warsaw, Illinois, on Pool 20 of the Mississippi River. Laboratory and office space is limited during the 8-week summer teaching session, but can be made available at other times of the year.

LOCATION:

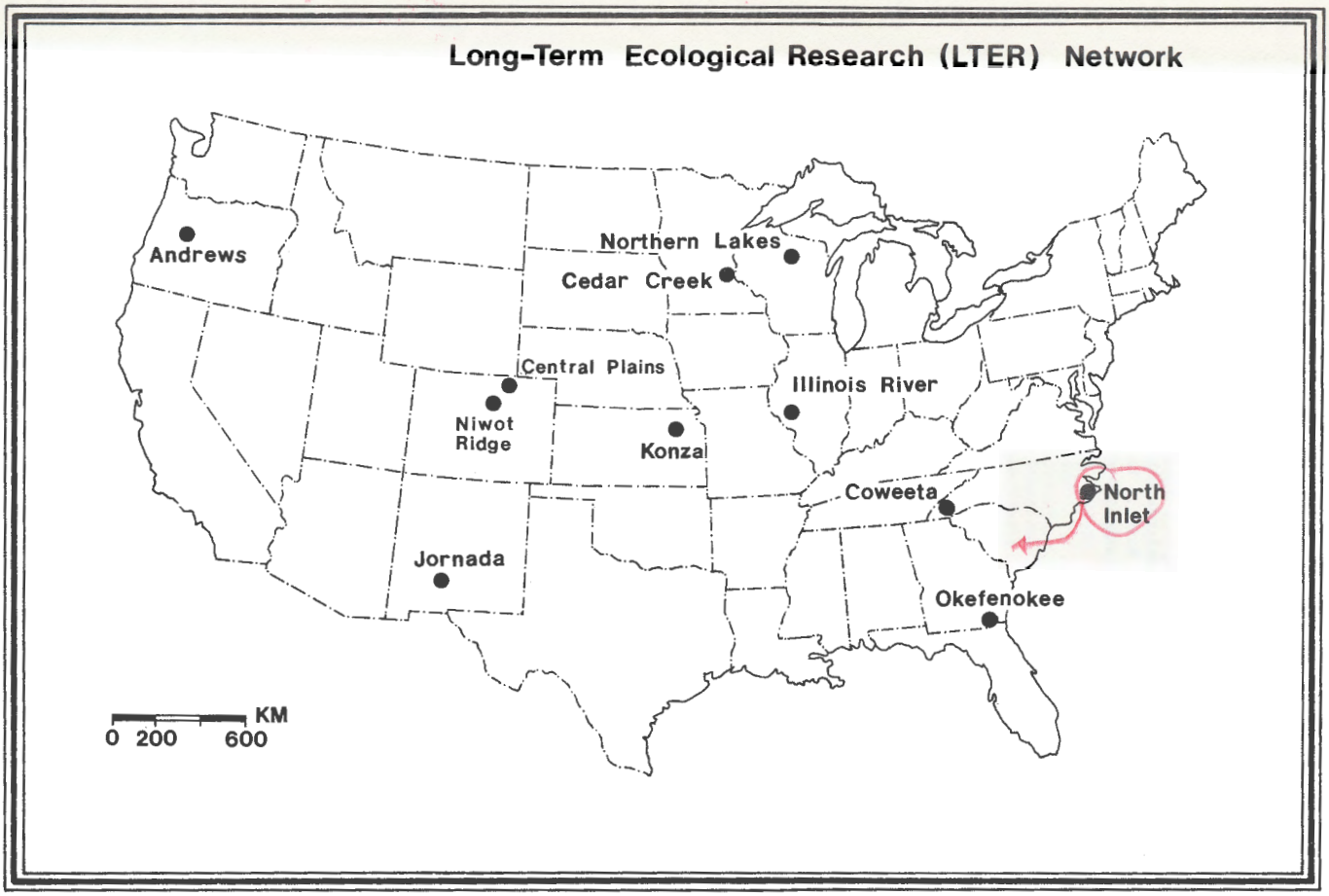
Pool 19, Mississippi	latitude:	40° 30' N
	longitude:	91° 21' W
	elevation:	163 m
Pool 26, Mississippi and Illinois Rivers	latitude:	38 59' N
	longitude:	90 30' W
	elevation:	127 m
Peoria Lake, Illinois River	latitude:	40 51' N
	longitude:	89 31' W
	elevation:	134 m

ADDRESSES:

Coordinating Investigator:
Dr. Richard E. Sparks
Illinois Natural History Survey
River Research Laboratory
Box 599
Havana, IL 62644
(309) 543-3950 and 543-3105

INVESTIGATORS:

J. Rodger Adams	- Sediment transport
Richard V. Anderson	- Fresh water ecology, invertebrate ecology
Nani Bhomik	- Fluvial geomorphology
Richard Cahill	- Chemistry
Robert Costanza	- Systems ecology
Misganaw Demissie	- Civil engineer, hydraulics, floodplains
Donald Gatz	- Meteorology, chemistry
Robert W. Gorden	- Ecosystems, energy flow, microbial ecology
James King	- Palynology
Kenneth S. Lubinski	- Pollution ecology, aquatic toxicology
Paul G. Risser	- Ecosystems
Robert A. Sinclair	- Data management
Wayne Wendland	- Meteorology, climate, tree rings, archaeology
Michael J. Wiley	- Systems modeling, population dynamics, competition



The current LTER sites comprising the national network are:

H. J. Andrews (Coniferous forest, Oregon State University and U. S. Forest Service);

Cedar Creek Natural History Area (Oak savanna, University of Minnesota);

Central Plains Experimental Range (Shortgrass steppe, Colorado State University);

Coweeta Hydrological Laboratory (Deciduous forest, University of Georgia and U. S. Forest Service);

Illinois and Mississippi Rivers (Large river ecosystems, Illinois Natural History Survey);

Jornada (Desert grassland scrub, New Mexico State University);

Konza Prairie Research Natural Area (Tallgrass prairie, Kansas State University);

Niwot Ridge (Alpine tundra, University of Colorado);

North Inlet (Coastal marine ecosystems, University of South Carolina);

Northern Lakes (Freshwater lakes, University of Wisconsin); and

Okefenokee National Wildlife Refuge (Freshwater swamp, University of Georgia and U. S. Fish and Wildlife Service).

JORNADA LTER SITE

SITE NAME: Jornada, consisting of Jornada Experimental range and New Mexico State University Ranch

INSTITUTIONAL AFFILIATION: New Mexico State University

LTER RESEARCH TOPICS: Factors limiting primary production
Experimental applications of nitrogen
Lysimeter studies
Effects of autocorrelated variables

PRINCIPAL BIOME: Desert

MAIN COMMUNITES: Desert playa grassland
Desert swale shrubland
Desert basin grassland
Desert bajada shrubland
Desert piedmont grassland
Desert mountain shrubland

EXISTING DATA BASES:
- Class A weather records (since 1915) supplemented by site-specific records.
- Data sets of varying detail and time periods exist on vegetation, mammals, ants, termites, decomposition, shrub associated insects, reptiles, amphibians, and soil's physical and chemical properties.

CLIMATE SYNOPSIS:
Climate characterized by abundance of sunshine, wide range between day and night temperatures, low relative humidity, evaporation rate averaging 229 cm per year, and variable precipitation. Average maximum temperature in June is 36° C; the average minimum is 13.3° C in January. Summer precipitation occurs as intense, convective thunderstorms that are localized and of short duration. The average annual precipitation is 230 mm with 52% occuring between July 1 and September 30. Five severe droughts have occurred during the past 100 years.

NARRATIVE:
The Jornada presents a representative cross section of the basin and range topography characteristic of the southwestern United States. The area extends from the flood plains of the Rio Grande at an elevation of 1,186 m to the crest of the fault-block sedimentary San Andreas Mountains at an elevation of 2,833 m. The Dona Ana Mountains on the NMSU Ranch are composed of extruded igneous rocks. Most of the Jornada basin is closed with no exterior drainage; water occasionally collects in scattered playas.

On the Jornada Plain, the major grass species on sandy soils are black grama (Bouteloua eripoda), mesa dropseed (Sporobolus flexuosus), and red threeawn (Aristida longiseta). Shrubs or shrublike plants on sandy soils include honey mesquite (Prosopis glandulosa), fourwing saltbush (Atriplex canescens), soaptree yucca (Yucca elata), and broom snakeweed (Xanthocephalum sarothrae). Extensive dunes have developed where mesquite has invaded sandy soils. Silt and clay soils, which receive water from surface runoff, are dominated by tobosa (Hilaria mutica) and burrowgrass (Scleropogon brevifolius). Creosotebush (Larrea tridentata) dominates the grasslands and the gravelly soils of the bajada slopes leading up to the mountains.

The small mammal community, mostly rodents, includes various species of heteromyids (Dipodomys spp. and Perognathus spp.), cricetids (Onychomys leucogaster, Peromyscus spp., and Neotoma spp.), and sciurids (primarily Sphermophilus spilosoma), in addition to the lagomorphs (Lepus californicus and Sylvilagus audoboni).

The bird population, dominated during the summer by insectivores and in

winter by granivores, includes a substantial number of resident species as well as annually appearing migrants. Various species of Chemidophorus, Holbrookia, Uta, and Phrynosoma make up the major part of the lizard community. The amphibians, all toads (Scaphiopus and Bufo spp.), are found seasonally. Dominant arthropods are a variety of seed harvesting ants (Pogonomyrex spp. and Pheidole spp.), plus subterranean termites. Other than these social insects, little is known of the arthropod fauna of this site.

FACILITIES:
There are no living quarters on the Jornada. The proximity to Las Cruces (less than a 30 minute drive) makes such facilities unnecessary. Visiting investigators often choose to camp at the base of the mountains; camping is pleasant much of the year. Laboratory equipment and space are available on a permission-share basis on the campus at NMSU. Contact should be made with the site director and investigator to arrange for use of these facilities.

LOCATION: 40 km north of Las Cruces, New Mexico.
latitude: 32° 30' N
longitude: 106° 45' W
elevation: 1,318 to 1501 m

ADDRESSES:

Coordinating Investigator:
Dr. Walter G. Whitford
Department of Biology
New Mexico State University
Las Cruces, NM 88003
(505) 646-3921

Site Director:
Dr. Walter G. Whitford
Department of Biology
New Mexico State University
Las Cruces, NM 88003
(505) 646-3921

INVESTIGATORS:

Walt Conley	- Vertebrate ecology
Gary Cunningham	- Plant physiological ecology
Mohammed Hussain	- Experimental statistics
John Ludwig	- Plant ecology
Walt Whitford	- Nutrient dynamics
Petrus Wierenga	- Soils physics

KONZA LTER SITE

SITE NAME: Konza Prairie Research Natural Area (KPRNA)

INSTITUTIONAL AFFILIATION: Kansas State University

LTER RESEARCH TOPICS: Role of fire, precipitation, and drought in a prairie ecosystem

PRINCIPAL BIOME: Tallgrass prairie

MAIN COMMUNITIES: Tallgrass prairie
Gallery forest

EXISTING DATA BASES:
- Vegetation analyses from 1971.
- U.S. Geological Survey hydrological record from 1979.
- LTER core measurements from 1981.

CLIMATE SYNOPSIS:

Temperate mid-continental climate. Yearly mean temperature is 13° C with a range of extremes from 6° C to 19° C. The January mean temperature is -3° C (range -9° C to 3° C) and the July mean is 27° C (range 27° C to 33° C). Annual precipitation is 835 mm of which 21 mm falls in July and 101 mm falls in January. Mean snowfall for January is 150 mm with an annual total of 521 mm. Mean annual wind speed is 11 miles/hr from the south.

NARRATIVE:

Tallgrass or bluestem prairie, a major ecosystem type, once covered up to 6.8% of the conterminous United States (exceeded only by eastern deciduous forest). Undisturbed examples of this ecosystem are rare because the prairie has been extensively converted to agricultural crop production.

Konza Prairie Research Natural Area (KPRNA) is representative of the Flint Hills, a dissected upland with hard chert- and flint-bearing limestone layers, resulting in steep-sided hills on which are exposed Permian limestone and shale layers. The ridges are characteristically flat, with shallow, rocky soils. The larger and wider valleys have deep permeable soils.

When acquired, the majority of KPRNA was exclusively dominated by vigorous native prairie species. Lowland areas with deep soils now have patches of these tall grasses that grow to 3 m by late summer. Gallery forests on Lower Kings Creek are dominated by chinquapin oak and bur oak. Green ash, hackberry, elm, sycamore, and walnut are other frequent species. The KSU herbarium contains more than 400 species collected from KPRNA. Woody plants have been mapped according to species and size on some portions of the Natural Area.

Konza Priaire is managed to approximate the condition of the presettlement ecosystem in order to produce research that will compare natural with manipulated systems, account for the stability over geologic time of this important ecosystem, and evaluate productivity and interactions of various components of the system.

Fire, started both by lightning and American Indians, influenced the nature of the presettlement prairie. Beginning in 1972, a number of burning treatments have been applied in order to approximate presettlement burning conditions and to investigate the effects of fire. Prescribed major burns are set when the warm-season dominant grasses begin active growth. Small burns are done at other seasons. Part of the long-term research objective is to determine which of these treatments yields a condition that can be called "control". The treatment boundaries follow watershed divides, thus facilitating the study of hydrologic and nutrient responses to treatments. The burning treatments involve the season of burning, the interval between burns, and burning in reference to annual rainfall.

FACILITIES:

The proximity of Konza Prairie to the city of Manhattan and Kansas State University campus reduces the need for on-site facilities. Even so, the on-site facilities are presently good and potentially excellent. Some rough lab space can be made available on the site, but finished space awaits renovation. Living accomodations are limited, and as a rule, are not available on the site.

LOCATION: 10 km south of Manhattan, Kansas.
latitude: 39° 05' N
longitude: 96° 35' W
elevation: 366 m

ADRESSESS:

Coordinating Investigator:
G. R. Marzolf
Division of Biology
Kansas State University
Manhattan, KS 66505
(913) 532-6643

Site Director:
Lloyd C. Hulbert
Konza Prairie Research Natural Area
Division of Biology
Kansas State University
Manhattan, KS 66506
(913) 532-6620

INVESTIGATORS:

L. C. Hulbert	- Fire in prairie vegetation regulation
G. R. Marzolf	- Stream ecology, reservoir limnology
D. W. Kaufman	- Vertebrate population genetics
J. L. Zimmermen	- Avian population ecology, breeding systems
T. M. Barkley	- Plant systematics, Great Plains flora
R. J. Robel	- Wildlife management, prairie chicken behavior
M. E. Gurtz	- Stream ecology, aquatic entomology
T. W. Evans	- Insect population ecology
T. R. Seastedt	- Soil ecology
R. T. Sherwood	- Plant ecology
E. J. Finck	- Vertebrate ecology
A. K. Knapp	- Plant ecology
J. V. Gelroth	- Site manager

NIWOT RIDGE / GREEN LAKES VALLEY LTER SITE

SITE NAME: Niwot Ridge (Mountain Research Station)

INSTITUTIONAL AFFILIATION: Institute of Arctic and Alpine Research
University of Colorado

LTER RESEARCH TOPICS:
- Paleoenvironment
- Treeline
- Climate
- Water and soils
- Primary production
- Pollution, disturbance, succession
- Mammals, fish, aquatic invertebrates
- Decomposers
- Management

PRINCIPAL BIOMES:
- Alpine tundra
- Sub-alpine forest

MAIN COMMUNITIES:
- Alpine tundra
- Spruce-fir forest
- Lodgepole pine
- Aspen
- Glacial lakes and streams

EXISTING DATA BASES:
- Climate data at 2,200, 2,500, 3,048, and 3,750 m (30 years).
- Climate at several intermediate and special sites (few years).
- Lake bathymetry, physical and chemical property surveys, pollen analyses.
- Primary production at 3,500 m (two years).
- Floral survey and voucher collections.
- Aerial photography.
- Natural history atlas of the area.
- Biosphere management plan.
- Atmosphere chemistry, wet- and dry-fall precipitation chemistry
- Extensive literature dealing with many aspects of geoecological studies.

CLIMATE SYNOPSIS:

High elevation, mid-continental climate with cold, wet winters and cool, dry summers. Yearly mean temperature is 1° C (3,048 m) and -4° C (3,750 m). At 3,048 m the January mean temperature is -13.2° C and the July mean is 8.5° C with a range of extremes from -37° C to 19° C. Of the 102 cm of precipitation, 80% falls as snow from September to May. Lakes are frozen from the first of October to the last of May. Mean annual wind speed is 10.3 m/sec.

NARRATIVE:

The Mountain Research Station (MRS) is a University of Colorado field research and teaching facility administered by the University's Institute of Arctic and Alpine Research (INSTAAR). MRS is surrounded by protected lands including the Indian Peaks Wilderness Area, City of Boulder Watershed, and Roosevelt National Forest. The main research area is Niwot Ridge which is located in Roosevelt National Forest and has been designated as an Experimental Ecological Reserve and as a Biosphere Reserve. Researchers may work in the Green Lakes Valley, an area completely closed to the public, by special agreement with the City of Boulder. The Niwot Ridge / Green Lakes area contains a variety of landforms (glaciers, glacial lakes, patterned ground, talus slopes, and mountain streams), periglacial features including permafrost, plant communities, and animals (trout, ptarmigan, pika, marmots, elk, deer, bear, and coyotes).

The University of Colorado LTER (CULTER) program seeks to integrate its studies with a perspective of the past provided by paleoenvironmental studies. CULTER researchers feel that current plant and animal communities are not in equilibrium with the climate but lag behind due to directional changes in the climate since the end of glaciation in the region. It is hypothesized that moderate disturbances to the environment will hasten recovery to conditions that are in equilibrium with the current environment. Historical and baseline data are being collected to determine the time frame for changes in the alpine region. Increasing pollution levels and disturbances are being monitored to provide comparative information for the future, as expansion of the Denver megalopolis and development of the Colorado energy industry surely will bring dramatic changes to this region. Short- and long-term studies on other components of the tundra system will provide pieces to the ecosystem puzzle. CULTER plans to develop management guidelines for the study area and the surrounding mountain regions by integrating both historical and current studies.

FACILITIES:
- Research building with wet and dry, gas and air supplied laboratories, soils room, darkroom, herbarium, library, and classroom.
- Small research buildings in the tundra
- One room classroom building
- Summer dining hall
- Shower and laundry facility
- 24 summer cabins, 14 winter cabins
- Snowmobiles for winter access
- Snowplows, bulldozers, and other support equipment
- Plumbing, electrical, and woodshops, and garage

LOCATION: 45 km northwest of Boulder, 85 km from Denver, Colorado.
- latitude: 40° 03' N
- longitude: 105° 37' W
- elevation: 2,900 to 4,060 m

ADDRESSES:

Coordinating Investigator:
Dr. Patrick J. Webber
Institute of Arctic and
Alpine Research
University of Colorado
Boulder, CO 80309
(303) 492-7909

Site Director:
Dr. James C. Halfpenny
Mountain Research Station
University of Colorado
Nederland, CO 80466
(303) 492-8841

INVESTIGATORS:

John Andrews	- Paleoecology
Roger Barry	- Climate
Erik Bonde	- Disturbance, pollution
Peter Birkeland	- Soils
John Bushnell	- Aquatic invertebrates
Nel Caine	- Water, soils
Ernie Flack	- Water
JoAnn Flock	- Pollution
David Greenland	- Climate
Kathy Hansen-Bristow	- Paleoecology
Jim Halfpenny	- Consumers, mammals
Jack Ives	- Paleoecology
Vera Komarkova	- Disturbances
Harvey Nichols	- Palynology
Misha Plam	- Water, snow
Susan Short	- Palynology
Wells Shulls	- Decomposers
Sam Shushan	- Pollution
Chuck Southwick	- Consumers, mammals
Michael Vigdorchik	- Geology
Pat Webber	- Primary production
Jay Windell	- Consumers, fish

NORTH INLET MARSH-ESTUARINE SYSTEM LTER SITE

SITE NAME: North Inlet (Hobcaw Barony)

INSTITUTIONAL AFFILIATION: Belle W. Baruch Institute for
Marine Biology and Coastal Research
University of South Carolina

LTER RESEARCH TOPICS: Patterns and control of primary production
Dynamics of selected populations
Organic accumulation
Patterns of inorganic contributions
Patterns of site disturbances

PRINCIPAL BIOME: Coastal marine

MAIN COMMUNITIES: Salt marsh
Estuarian benthic
Intertidal
Barrier island
Open beach
Inshore oceanic

EXISTING DATA BASES:
- Climatic data (four years).
- Daily water samples (nutrient and physical measurements for two years).
- Meiofauna sampling for seven years.

CLIMATE SYNOPSIS:
Maritime influenced climate. Typical yearly air temperature ranges from -4° C to 36° C; water temperature ranges from 8° C to 28° C. Rainfall averages 115 cm per year. Occasional snow.

NARRATIVE:
Hobcaw Barony is a 17,500 acre (7,085 ha) tract of forest located near Georgetown, S. C. The property was set aside in perpetuity for the study of marine biology, forestry, and wildlife through the will of Belle W. Baruch. The LTER study site at North Inlet represents one of the most pristine marsh estuaries on the east coast. Interdisciplinary research programs at the Belle W. Baruch Institute for Marine Biology and Coastal Research of the University of South Carolina add to our basic and applied knowledge of both the commercial and ecological values of the coastal zone.

The primary research area is a 2,630 hectare, high-salinity marsh which is separated from the Atlantic Ocean by sandy barrier islands and bordered on the west by loblolly and longleaf pine forests. Tidal amplitudes are on the order of 2 meters and the seasonal water temperature range is 4 C to 32 C. Wetland habitats include exposed and sheltered sandy beaches; intertidal mudflats and oyster beds; submerged algae beds; sand, shell, and mud benthic habitat; rock jetty; and bird rookery islands. More than 1,200 hectares of brackish and fresh water marshes border the Winyah Bay side of Hobcaw Barony.

The LTER program involves 15 principal investigators who are concerned with biological, chemical, and physical components of the North Inlet Estuarine-Marshland Ecosystem. The LTER Population Dynamics program examines the abundance, distribution, and life history patterns of zooplankton, motile epibenthos, benthic macrofauna, meiofauna, and fishes. Primary production rates for Spartina grasses and phytoplankton are determined on a regular basis. Water columns and interstitial water collections are analyzed for inorganic and organic constituents. Physical measurements of the water columns and weather are constantly monitored. Full time LTER technicians and two principal investigators are located at the field laboratory. Visiting investigators are encouraged to interact with the staff and examine the data base.

The Baruch Institute has published more than 400 papers and books on studies conducted in North Inlet over the past 12 years. The Belle W. Baruch Library in Marine Sciences, a publication by the University of South Carolina Press, consists of symposia publications relating to coastal marine subjects; twelve volumes have been published.

FACILITIES:
- Two research buildings (14,000 sq ft) with 18 laboratory rooms. Running sea water available in each building.
- Aquarium building (1,600 sq ft) with various sized aquaria and running sea water.
- Dormitories with cooking facilities can accommodate approximately 55 persons.
  cooking facilities.
- Kimbel Meeting Lodge (2,450 sq ft) with seating capacity of 100 persons. Kitchen facilities present.
- Boats and general field collecting gear are available. General laboratory equipment is available by contacting the Director.
- Computer terminal.

LOCATION: 1.6 km north of Georgetown, South Carolina on US #17.
latitude: 33° 30' N
longitude: 79° 13' W
elevation: 4 m above sea level

ADDRESSES:

Coordinating Investigator:	Site Director:
F. John Vernberg	Dr. Dennis M. Allen
Baruch Institute	Marine Field Laboratory
University of South Carolina	P.O. Box 1630
Columbia, SC 29208	Georgetown, SC 29208
(803) 777-5208	(803) 546-3623

INVESTIGATORS:

Dennis M. Allen	- Secondary production, invertebrates
Ronald D. Bonnell	- Data management modeling
Bruce C. Coull	- Meiofauna, population dynamics
Richard F. Dame	- Primary production, vascular plants
John M. Dean	- Fish populations, secondary production
Robert J. Feller	- Population dynamics, secondary production
Leonard R. Gardner	- Geochemistry, primary production
Bjorn J. Kjerfve	- Physical oceanography
Henry N. McKeller	- Nutrient modeling
Douglas D. Nelson	- Sediments
John D. Spurrier	- Statistical evaluation
Stephen E. Stancyk	- Zooplankton
Harold Stevenson	- Microbiology
F. John Vernberg	- Physiological ecology
Douglas F. Williams	- Geochemistry
Richard G. Zingmark	- Primary production, algae

NORTHERN LAKES LTER SITE

SITE NAME: Northern Lakes (Trout Lake Biological Station)

INSTITUTIONAL AFFILIATION: University of Wisconsin (Madison)

LTER RESEARCH TOPICS: Groundwater hydrology and geochemistry
Paleolimnology
Physical and chemical limnology
Producer and consumer ecology

PRINCIPAL BIOMES: Northern temperate lakes
Mixed conifer-deciduous forest

MAIN COMMUNITIES: Oligotrophic, dystrophic, eutrophic lakes
Temporary forest ponds
Warm and cold streams
Sphagnum-leatherleaf bog
Conifer swamp
Aspen-birch forest
Red oak-sugar maple forest
Jackpine forest
Red pine-white pine forest

EXISTING DATA BASES:

- Historical data (1924-1942) on the chemistry, flora, fauna of the lakes.
- Survey of all lakes by Department of Natural Resources (1960-62), including physical and chemical parameters.
- Lake Mendota data base; from 1890's to present, including five years of primary productivity data (1976-1980).
- Climatological data as early as 1890's from five stations within 45 km (including NADP site 5 km from station).
- Wisconsin Department of Natural Resources Five-Lake Project fish population data (1954 to present).
- Land use, cover photography, maps from 1931, 1955, 1968, 1979.

CLIMATE SYNOPSIS:

Continental climate with an average annual temperature of less than 5° C. The area receives approximately 76 cm of precipitation, about 30% of which falls in the spring. Snow cover averages 127-152 cm for about 120 days each year. Lakes are ice covered from late November to late April.

NARRATIVE:

Our major goals are to establish a data collection, management, and analysis system that will: 1) detect long-term changes in the physical, chemical, and biotic features of lakes; 2) help us understand the linkages among water and soil chemistry, climate, hydrology, and biology; 3) detect lake features which enhance stability and resiliency to natural and anthropogenic disturbances.

The Northern Highlands Lake District includes all of Vilas and parts of Iron, Price, and Oneida Counties in Wisconsin and Gogebic County in Michigan. This area encompasses 10,000 sq. km and contains thousands of lakes. Within a 10-km radius of the biological station at Trout Lake, there are 68 named lakes, 28 unnamed lakes, and 60 km of stream length. Vilas County lakes range in pH from 4.5 to 9.3 and in methyl orange alkalinity from 0 to 121 mg/l of calcium carbonate. This area has one of the largest concentrations of lakes in the world, comparable only to a complex on the Minnesota-Ontario border and to areas within Canada and Finland.

The diversity of lakes in the region provides an excellent opportunity for research. From 1924 to 1942, Birge, Juday, and their co-workers collected massive amounts of data on the regional lakes, and laid the groundwork for the

study of comparative limnology in North America. Their work gives a unique opportunity to assess long-term changes in lake ecosystems. We have designed a research program that will allow us to use efficiently the data collected more than 50 years ago and at the same time provide information that will be invaluable to researchers 50 years in the future.

The combination of the regional abundance of lakes, the historic data base, and the current research provides an invaluable setting for shorter-term research projects. We, at the Northern Lakes portion of LTER, welcome researchers to take advantage of the research opportunities at the Trout Lake Biological Station.

FACILITIES:

The all-season laboratory is a two-story structure located about 35 m from the shore of Trout Lake. Facilities include a chemistry and five research laboratories equipped with gas, natural and heated well water, Trout Lake water, compressed air, and electricity. Two animal rooms contain the usual laboratory utilities, as well as direct sources of epilimnetic and hypolimnetic lake water. The Station houses an Apple II computer in addition to a microcomputer with two disk drives and a modem for phone communications with other computers. Boats, a library-conference room, and workshop, also are available for visitor use.

A modern year-round house can accomodate up to 10 researchers. During the summer, an additional 15 scientists can stay in seasonal housing on Station Grounds or nearby in space rented by the University.

LOCATION: 320 km north of Madison, Wisconsin.
latitude: 46° 00' N
longitude: 89° 40' W
elevation: 500 m

ADDRESSES:

Coordinating Investigator:
Dr. John J. Magnuson
Laboratory of Limnology
University of Wisconsin
Madison, WI 53706
(608) 262-2840

Site Director:
Dr. Timothy Kratz
Route 1, Box 76
Boulder Junction, WI 54512
(717) 385-2750

INVESTIGATORS:

Michael S. Adams	- Macrophytes, paleolimnology
Mary Anderson	- Hydrogeology
David Armstrong	- Chemical limnology
Carl Bowser	- Biochemistry
Thomas D. Brock	- Microbial ecology
Timothy Kratz	- Wetland ecology, paleolimnology
John T. Magnuson	- Consumer ecology
Robert Ragotzkie	- Physical limnology
Vicki Watson	- Primary production

OKEFENOKEE LTER SITE

SITE NAME: Okefenokee National Wildlife Refuge

INSTITUTIONAL AFFILIATION: University of Georgia
U. S. Fish and Wildlife Service

LTER RESEARCH TOPICS: Successional dynamics
Lignocellulose degradation
Food webs
Effects of drought, fire, and human disturbance on the above

PRINCIPAL BIOME: Freshwater wetland

MAIN COMMUNITIES: Blackwater lakes and streams
Aquatic macrophyte marsh
Grass-sedge marsh
Shrub swamp
Cypress swamp
Gum swamp
Bay swamp
Mixed swamp
Southern pine

EXISTING DATA BASE:
- Meteorological from 1950.
- Water level from 1950.
- River outflow.
- Aerial photography from 1936.
- Nutrient input/output, hydrology, and methane flux.
- Vegetation map.
- Breeding bird habitat.
- White ibis nutrient contributions.
- Invertebrate populations and biomass.
- Vertebrate composition.
- Dendrochronological data.

CLIMATE SYNOPSIS:

Warm temperate-subtropical with mild, wet winter, hot, wet summer and dry autumn. Precipitation is 1,000 to 1,500 mm/year. Mean temperature in January is 11.7° C and in July is 27.1° C.

NARRATIVE:

The Okefenokee Swamp, located in southeastern Georgia and northern Florida, is one of the largest freshwater wetland complexes in the United States. The swamp watershed occupies 3,826 sq. km of which 1,775 sq. km (44%) is swamp proper.

Several geological factors explain the swamp's existence: 1) general flatness of the Atlantic Coastal Plain is important in determining water flow characteristics within the swamp; 2) Trail Ridge, a depositional feature on the eastern side, is implicated in impounding water within the swamp basin; and 3) impermeable Miocene and Pliocene deposits immediately beneath the swamp prevent vertical seepage and cause "ponding" of Okefenokee waters. Prevailing theories of basin formation hypothesize that the Okefenokee began as a saltwater lagoon or salt marsh separated from the sea by Trail Ridge. An alternative theory, developed from ongoing research in the swamp, hypothesizes that Okefenokee morphology resulted from a series of freshwater lakes which alternately receded and expanded within the watershed basin.

Since downward seepage is inhibited, the swamp is above the regional water table and can be considered a perched watershed. Water enters the swamp as

direct precipitation and as runoff from the uplands, with direct precipitation contributing the most. Evapotranspiration is the major cause of water loss from the system, accounting for over 78% of the water loss; only 22% is lost via drainage by the St. Mary's and Suwannee Rivers.

The Okefenokee is a spatially and temporally heterogeneous system fluctuating in response to variability of water balance, hydroperiod, and catastrophic disturbances. Spatial heterogeneity provides a number of wetland types available for study in one area. Swamp forests of large trees and shrubs, shrub thickets, marshes with grasses, sedges, and aquatic macrophytes are the most extensive habitats within the swamp.

Hamilton (1977) classified vegetation into the following categories: islands, prairies, shrub swamps, black gum forests, pure bay forests and mixed cypress forests. Islands cover 8% of the swamp and have vegetation similar to that of uplands, dominated by a pine-flatwoods complex. Two types of marsh, known as "prairies", exist in the swamp covering 21% of the area. Aquatic bed macrophyte prairies are dominated by emergent, floating-leaved and submerged hydrophytes, and emergent prairies are dominated by grasses and sedges. Shrub swamps cover 34% of the area. Black gum (Nyssa sylvatica var. biflora) and bay (Gordonia lasianthus) forests together comprise 6% of the swamp area. 23% of the swamp is mixed cypress (Taxodium ascendens) forest which includes bay and black gum species; only limited areas are pure cypress.

Throughout history, disturbances have played a vital role in forming and maintaining the swamp's complexity. Natural phenomena such as drought, fire, and hydroperiod are important to swamp dynamics. Human intrusions such as boat trails and canals, lumbering, sill construction, and channelization have resulted in perturbations with potentially important ramifications for management. These natural and anthropogenic perturbations present an unusual opportunity to examine ecosystem development and origin.

FACILITIES:

A university trailer at Camp Cornelia can accommodate up to 14 researchers; it has a kitchen, a small laboratory (12' x 12') and limited storage space. Boats, outboard motors, pickup trucks and field equipment are available for researchers. We are renovating a U. S. Fish and Wildlife Service log building for use as a complete field laboratory.

LOCATION: Camp Cornelia is 18 km south of Folkston, Georgia.
latitude: 30° 32' to 31° 7'N
longitude: 82° 8' to 82° 30'W
elevation: 37 m

ADDRESSES:

Coordinating Investigator:
Bernard C. Patten
Institute of Ecology
University of Georgia
Athens, GA 30602

Project Manager:
Jeroen Gerritsen
Institute of Ecology
University of Georgia
Athens, GA 30602

INVESTIGATORS:

G. Ronnie Best	- Plant ecology
George Brook	- Hydrology
Michael J. Duever	- Hydrology, plant ecology
Byron J. Freeman	- Vertebrates, biogeochemistry
Jeroen Gerritson	- Aquatic ecology
Robert E. Hodson	- Microbial ecology
Joshua Laerm	- Vertebrate ecology
Alexander E. MacCubbin	- Microbial ecology
Bernard C. Patten	- Ecosystem theory
Karen G. Porter	- Aquatic ecology
Chris Trowell	- Archaeology, history
Joe R. Wadsworth	- Geology